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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/842,714	04/27/2001	Eun-Hwa Hong	030681-297	7444

7590

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EXAMINER

LISH, PETER J

ART UNIT

PAPER NUMBER

1754

DATE MAILED: 12/04/2002

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/842,714

Applicant(s)

HONG ET AL.

Examiner

Peter J Lish

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 January 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) 16-23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 and 24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 16-23 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 7.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1 and 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a) The term "locally" is a relative term which renders the claim indefinite. The term "locally" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

b) It is not clear what the 'means for growing carbon nanotubes from heated catalyst' is in claim 24. This appears only to be a recitation of what occurs. There is no physical entity associated with the growth of a nanotube.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 5, 7-10,12-15, and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Tennent et al. (USPN 5,165,909).

Tennent teaches a method of producing carbon nanotubes which comprises contacting a suitable carbon-containing gaseous compound with suitable metal-containing particles at elevated temperatures. The surface of the metal-containing particle may be independently heated to a temperature higher than the gaseous compound by electromagnetic radiation (column 4, lines 45-50). Concerning claims 12 and 14-15, official notice is taken by the examiner that laser, radio frequency, and microwave heating are all means of supplying electromagnetic radiation, and thus selectively heat the metal materials, as taught by Tennent.

Tennent also discloses that the metal particles may contain a variety of transition metals, including iron, cobalt, or nickel, or an alloy or mixture thereof. Furthermore, the metal particles may be precipitated as metal oxides, hydroxides, carbonates, or other metal salts that thermally decompose to metallic particles (column 8, lines 3-10, 17-40). Additionally, in order to grow fibrils, or nanotubes, throughout the entire reactor volume, the metallic particles may be formed by thermolysis of a metal-containing vapor, such as ferrocene, in the reactor itself (column 8, lines 50-60).

Tennent also teaches that suitable carbon-containing gases include benzene, methane, acetylene, and propane. He teaches that diluents such as argon, and inert gas, or compounds capable of reaction with carbon to produce gaseous products, such as hydrogen gas may be present (column 7, lines 36-65).

Regarding claim 24, Tennent teaches an apparatus with which the process of continuously forming nanotubes may be accomplished (see Figure 6). It is taught, therefore, to provide an apparatus to carry out the process of Tennent, which comprises a means for

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introducing catalyst, supplying reactant gas, and selectively heating the catalyst. Additionally, the apparatus only requires the 'means' and not the catalyst.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tennent et al. as applied to claim 1 above, and further in view of Mandeville et al (USPN 6,423,288). Tennent does not disclose the means by which the catalyst will be loaded onto the support. However, in a process of forming carbon fibrils (MWNTs) through Chemical Vapor Deposition on a transition metal catalyst, Mandeville et al teach various methods of loading the catalyst. "The transition metal may be deposited on the substrate by any commonly used technique for accomplishing such deposition. Vapor deposition, sputtering, and impregnation may all be suitable" (column 4, lines 33-36). Precipitating the metal onto the support by evaporating an aqueous or organic medium is also disclosed (column 4, lines 36-49).

It thus would have been obvious to one of ordinary skill at the time of invention to perform the loading of the catalyst onto the support or substrate by impregnation, incipient wetness, deposition, spraying, etc, as taught by Mandeville et al., in the nanotube production process of Tennent et al in order to provide an effective catalyst.

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Claims 6 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tennent et al. as applied to claim 1 above and further in view of Kambe et al. (USPN 6,045,769). Tennent neither teaches the use of hydrogen sulfide gas in the carbon-containing gas, nor in converting the metal particles to metal sulfides. Kambe, however, in a process of forming carbon fibrils through chemical vapor deposition, teaches that the reactant stream can include other reactants such as hydrogen gas or hydrogen sulfide (column 10, lines 63-65). Thus it would have been obvious to one of ordinary skill at the time of invention to use a hydrogen sulfide diluents, as taught by Kambe, in the process of Tennent.

Kambe et al. also disclose a means of catalyst production whereas an iron precursor is reacted with "preferred second reactants serving as a sulfur source, including for example hydrogen sulfide gas" (column 3, lines 61-62). Thus it would have been obvious to one of ordinary skill at the time of the invention to use hydrogen sulfide gas to form a metal sulfide for use as a catalyst in the process of Tennent et al. in order to provide an effective catalyst.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J Lish whose telephone number is 703-308-1772. The examiner can normally be reached on 9:00-6:00 Monday-Friday.

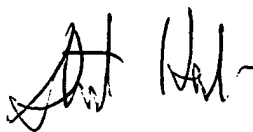
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 703-308-3837. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-305-9311 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

A handwritten signature in black ink, appearing to read "Stuart L. Hendrickson", with a stylized flourish at the end.

PL

November 22, 2002

STUART L. HENDRICKSON
PRIMARY EXAMINER